REMARKS

Examiner's Rejections and Objections

The foregoing Amendment and remarks which follow are responsive to the final Office Action mailed July 25, 2002. In that Office Action, the Examiner rejected Claims 1-3, 6-10, and 13-15 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,038,355 issued to Bishop ("Bishop") in view of U.S. Pat. No. 6,317,242 issued to Ozeki et al. ("Ozeki"). The Examiner further rejected Claims 4 and 11 under 35 U.S.C. § 103(a) as being unpatentable over Bishop in view of Ozeki in further view of U.S. Pat. No. 5,864,708 issued to Croft et al. ("Croft"). Finally, the Examiner rejected Claims 5 and 12 under 35 U.S.C § 103(a) as being unpatentable over Bishop in view of Ozeki in further view of U.S. Pat. No. 4,829,596 issued to Barina ("Barina").

Applicants' Response

I. 35 U.S.C. § 103(a) - Claims 1-3, 6-10, and 13-15

In Applicant's view, neither the Bishop reference nor the Ozeki reference disclose an optical pathway forming independent parallel optical connection between said transmitter LED on one of said circuit cards and said receiver photodiode on any one of said circuit cards as claimed in the present invention. Further, Applicant believes that neither the Bishop nor Ozeki references

disclose a plurality of circuit cards maintained in fixed relationship to another via a common backplane to maintain continuous optical intercard communications between each of the circuit cards when the circuit cards become intermittently dislodged from electrical connection to the backplane as claimed in the present invention.

As to independent Claims 1, 8, and 15, the Examiner stated that such claims were obvious under 35 U.S.C. § 103(a) over the Bishop reference in view of the Ozeki reference. Applicant respectfully submits that both the Bishop and Ozeki references are distinguishable from the present invention. Furthermore, in Applicant's view, combining the Bishop and Ozeki references would not produce the present invention. In this respect, Applicant respectfully submits that independent Claims 1, 8 and 15, as amended, are novel in view of the cited references. A more detailed discussion explaining the distinguishable aspects of the alleged prior art is provided below.

A. *The Present Invention*

The present invention overcomes several deficiencies in the prior art by providing a shock-resistant system which initiates intercard optical communications between the circuit cards in a computer system. Advantageously, the shock-resistant system forms

an optical pathway between each of the circuit cards. Each optical pathway forms a respective independent parallel optical connection between the transmitter LED on one of the circuit cards and the receiver photodiode on any one of the circuit cards. By providing such independent parallel optical connections, each of the circuit cards are capable of communicating with one another without introducing the problems generally associated with optical systems having shared paths. The independent parallel optical connections allow for simplified programming since each packet of data transmitted across the independent parallel optical connection already assumes its target destination. In this respect, such independent optical connections substantially reduce or eliminate the need to integrate programming steps which sort through and route data to the proper destination.

By providing such independent parallel optical connections between each of the circuit cards, the requirement for additional encoding/decoding electronics is reduced, incidence of cross-talk between signals is reduced, and ability to maintain a parallel connection is maintained when external shock is exerted upon the system. In this respect, the optical communications are generally maintained in parallel such that should any one circuit card become dislodged from data connectors on the backplane, optical communication between other circuit cards would remain functional.

Additionally, the present invention maintains continuous optical intercard communications between each of the circuit cards when the circuit cards become intermittently dislodged from electrical connection to the backplane. An objective of the present invention is to withstand extreme external environmental conditions which generally cause interruptions in communication between circuit cards mounted within a shock-resistant enclosure. While intercard communications may be accomplished by using transmitter LEDs and receiver photodiodes on the circuit cards, the circuit cards of the present invention are mounted to the common backplane to allow for wireless communication between the circuit cards. Preferably, the circuit cards are rigidly mounted to the common backplane so as to minimize dislodgement of the circuit cards from circuit card connectors disposed on the common backplane. As is generally apparent is most contemporary computer systems, under extreme environmental conditions, high impact force or shock may intermittently dislodge the circuit cards from electric connection to the backplane. Should such dislodgement of circuit cards formed according to the present invention occur, so long as electrical contacts between the circuit cards and their respective circuit card connectors are substantially maintained, intercard communications are advantageously preserved. Such configuration allows the circuit cards to maintain continuous optical intercard

communications despite such intermittent dislodgement. For example, the system formed according to the present invention may be utilized as a redundant communication system which may maintain continuous intercard communications despite intermittent dislodgment. As will be discussed in further detail, none of the cited references disclose such independent parallel optical connections or exhibit such advantages.

B. The Bishop Reference

In the Final Office Action, the Examiner stated that it would have been obvious to combine the optical transmission/reception interfaces disclosed in Bishop with the optical transceiver modules disclosed in Ozeki to provide bi-directional optical data transmission and reception between a plurality of components within a computer system. As understood by Applicant, the Bishop reference fails to disclose independent parallel optical connections formed along optical pathways and further fails to disclose maintaining continuous optical intercard communications. Instead, it appears that dislodgment of the daughter cards disclosed in Bishop would impede communications between the daughter cards. As will be discussed in further detail below, Bishop discloses a substantially serial system which passes optical signals along a shared path between each of the daughter cards.

The circuit cards of the present invention do not pass optical signals on to other circuit cards via any shared paths. Instead, each of the circuit cards of the present invention form their own independent parallel optical connections between the transmitter LED and the receiver photodiode on any one of the circuit cards, free of any shared paths. By forming such independent parallel optical connections, external shock exerted upon the backplane, slight misalignments, and intervening modules will not substantially effect the intercard communications.

As understood by Applicant, Bishop conducts serial optical communications by relying upon a series of mirrors and beam splitters on each of the daughter cards to allow for optical communications therebetween. These mirrors and beam splitters appear to reproduce and split optical signal such that Bishop discloses shared optical paths formed between each of the daughter cards. More particularly, as understood by Applicant, relatively precise alignment of the daughter modules is required in order to allow both a left-going optical bus path 62 and a right-going optical bus path 64 to pass through each of the daughter modules. Bishop, col. 4, lns. 24-34. In this respect, it appears that communication between the daughter modules may be interrupted or made impossible if one of the adjacent daughter modules is not precisely aligned to allow optical paths 62 and 64 shared between

all of the daughter cards to pass therethrough.

For example, as shown in FIG. 1 of Bishop, proper flow of optical light along the shared paths 62 and 64 relies upon the alignment of the daughter modules in an upright position. As stated in Bishop itself, "all participating boards must be adjacent with no intervening non-optical boards." Bishop, col. 4, lns. 61-62. Optical transmissions are generally conducted through air and physical obstacles blocking the path of transmission would generally impede or prevent optical transmissions. In fact, Bishop describes the shared paths 62 and 64 as passing through two holes 31 and 33 which are "accurately positioned near and relative to the system bus connector." Bishop, col. 4, lns. 58-61. These holes are described as being extremely small, or about "1/8-1/4 in each." Bishop, col. 4, ln. 58. Such extremely small holes would appear to require a high degree of precision in aligning the cards. Thus, according to the limitation described by Bishop, it appears that an intervening board would essentially impede communication by blocking the shared paths 62 and 64. Bishop states that "[w]hile there can be a significant loss of signal when boards are separated by intervening boards, or because of misalignment, these losses are comparable to those found in relatively short runs of optical fibers." Bishop, col. 5, lns. 4-7. Thus, it appears that even slight dislodgement or misalignment of the daughter cards might

interrupt communication between some, if not all, of the daughter cards.

By contrast, the present invention overcomes such deficiencies by forming an optical pathway between each of the circuit cards which forms independent parallel optical connections between each of the circuit cards. These connections are each independent in nature and do not require the circuit cards to be precisely aligned or that there be any shared paths. For example, where first, second and third circuit cards are provided, an independent parallel optical connection may be formed between the first and second circuit cards, between the second and third cards, and between the first and third cards. In this respect, none of the connections rely upon alignment of the cards and the optical connections between the circuit cards are independent of each other instead of shared as in Bishop.

Advantageously, forming such independent parallel optical connections substantially reduces the need for additional electronics which may otherwise be required to route data along the optical connections. Because Bishop appears to form shared paths, each of the daughter cards may be required to encode and decode data transferred along the shared paths for routing data to the proper recipient daughter card. However, because the present invention forms independent parallel optical connections between

each of the circuit cards, the connections are each assigned circuit card pairs. In this respect, such connections may not need additional instructions and programming to indicate where the data should be traveling since such connections are already preassigned.

Additionally, while Bishop does state that "[l]ight need not necessarily pass through holes, however, but can instead pass along one side of the boards if a clear path is available," it appears that nothing more is disclosed which would enable one skilled in the art to construct or even understand how the optical interfaces could be positioned on the daughter modules. Bishop col. 4, lns. 65-67. Nevertheless, even if the optical interfaces were disposed on a "side of the boards," the complex configuration of mirrors and beam splitters appears to suggest that communication between the daughter boards would still rely upon precise alignment of the boards and would still be serial in nature. In Applicant's view there is no suggestion that the connections would become independent or parallel since the paths would still be shared between all the daughter cards. Further, it appears that even if the paths were to pass along a side of the daughter boards, the application of an external shock upon the Bishop system would force the daughter modules into misalignment and disable optical communications therebetween.

Therefore, Applicant respectfully submits that the Bishop reference is distinguishable from the present invention and fails to disclose independent parallel optical connections formed between the transmitter LED on one of the circuit cards and the receiver photodiode on any one of the circuit cards.

C. The Ozeki Reference

The Examiner cited the Ozeki reference has having light emitting/receiving circuits. However, Applicant respectfully submits that Ozeki fails to disclose independent parallel optical connections formed between the transmitter LED on one of the circuit cards and the receiver photodiode on any one of the circuit cards. In Applicant's view, no independent parallel optical connections are disclosed in Ozeki because Ozeki relies upon a network of designated input nodes, output nodes, and repeaters which relay data.

As understood by Applicant, Ozeki is distinguishable from the present invention in that it merely discloses a communication system which relies upon complex additional circuitry to "repeat" incoming optical data and send this optical data off to other circuits. As described in Ozeki, a series of nodes are provided which relay data using receiving/emitting circuitry. More specifically, FIG. 1 illustrates that nodes A and C are dedicated

"light input nodes through which an externally entered electrical signal is converted to light and input to the optical bus 20," nodes B, D, and F "act as light output nodes through which signal light propagated in the optical bus 20 is received and converted back to an electrical signal for output from the bus 20" while node E "operates as a repeat node that received propagated light and sends out the received light for retransmission." Ozeki, col. 6, lns. 13-21. Additionally, "each light receiving/emitting circuit 42 has the repeater 42c that receives light from the opposite edge of the bus 20 and sends the received light back toward the opposite edge." Ozeki, col. 6, lns. 28-31. Thus, it appears that failure of the repeater, which essentially acts as a hub, might be detrimental by interrupting communication between the dedicated input and output nodes. Use of the repeaters suggests that there is a network of shared paths. Instead of forming <u>independent parallel optical connections</u> as in the present invention, each of the nodes appear to share paths by receiving and processing incoming data while retransmitting such data to other nodes.

While the Examiner states that Ozeki discloses optical transmission/reception interfaces, Applicant submits that such elements cannot be taken out of context. As previously described, the receiving/emitting circuit appears to require the use of a repeater to process incoming data and reproduce this data for

retransmission. As Applicant understands, there is no suggestion in Ozeki that the receiving/emitting circuit could be simply integrated with other devices without the presence of the repeater. Ozeki suggests that the repeater is integrated to overcome difficulties discovered. In particular, Ozeki states that "it is difficult to transmit signal light from an input node directly to an output node on the same edge. . . each light receiving/emitting circuit 42 has the repeater 42c that receives signal light from the opposite edge of the bus 20 and sends the received light back toward the opposite edge."

In the present invention, there is no such repeater since no signals are being retransmitted. Each of the circuit cards in the present invention has its own independent parallel optical connection formed with another circuit card. Since these connections are independent, there is no need to retransmit the optical signals to other cards. In fact, retransmitting the signals to other cards would likely be disadvantageous to the independent parallel optical connections since circuit cards may confuse retransmitted data with data transferred along the optical pathway.

Therefore, Applicant respectfully submits that the Ozeki reference is distinguishable from the present invention and also fails to disclose independent parallel optical connections formed

between circuit cards.

D. *Combining the Bishop and Ozeki References Will Not Create the Present Invention.*

Applicant respectfully submits that combining the Bishop and Ozeki references together will not create the present invention. Applicant believes the Bishop and Ozeki references are distinguishable from the present invention. However, even assuming arguendo, combining the Bishop and Ozeki references would create a wholly different invention in comparison to the present invention. The present invention forms independent parallel optical connections between each of the circuit cards and further maintains continuous optical intercard communications between each of the circuit cards when the circuit cards become intermittently dislodged from electrical connection to the backplane. However, at best, it appears that a combination of the Bishop and Ozeki references might create a computer system having daughter modules which communicate serially and rely upon precise alignment of optical circuitry and repeaters for allowing the daughter modules to communicate with each other. Even further, in Applicant's view, there is nothing to indicate in the Bishop reference that the nodes and associated circuitry of Ozeki could operate with the daughter modules of Bishop. In fact, Ozeki's use of repeaters and dedicated

input and output nodes appears to suggest that the two systems are incompatible since Bishop utilizes a pass-through type optical circuitry which relies upon beam splitters and mirrors instead of repeaters.

IV. Request for Allowance

Applicant submits that Claims 2-7 further define novel details of the invention as cited in independent Claims 1 while Claims 9-14 further define novel details of the invention as cited in independent Claim 8. On the basis of the foregoing, Applicant submits that the stated grounds of rejection have been overcome, and that such claims are in now condition for allowance. An early Notice of Allowance is therefore respectfully submitted.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made".

Should the Examiner have any suggestions for expediting allowance of the application, the Examiner is invited to contact Applicant's representative at the telephone number listed below. If a fee is required, please charge Account Number 14-1325.

Respectfully submitted,

Date: Oct 18, 2004 By: Bruce B. Brunda

Bruce B. Brunda
Registration No. 28,947
STETINA BRUNDA GARRED & BRUCKER
75 Enterprise, Suite 250
Aliso Viejo, CA 92656
(949) 855-1246

BBB:STB
T:\Client Documents\NORTH\390a\NORTH-390A final Amendment(v2).wpd

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend the following Claims:

1. (Amended) A shock-resistant system for operatively interconnecting circuit cards within a computer system to enable data to be transmitted and received therebetween comprising:

a) a common backplane having a plurality of circuit card connectors disposed in spaced apart relation thereon for supporting circuit cards in a generally upright parallel relationship;

b) a plurality of circuit cards, each of said circuit cards being mounted to one of said circuit card connectors, each of said circuit cards having a transmitter LED and a receiver photodiode formed thereon; ~~a first circuit card mounted to one of said circuit card connectors, said first circuit card having a first transmitter LED and a first receiver photodiode respectively formed thereon,~~

~~c) a second circuit card mounted to another of said circuit card connectors, said second circuit card having a second transmitter LED and a second receiver photodiode respectively formed thereon, and~~

c) an optical pathway formed between each of said circuit cards, each optical pathway forming a respective

independent parallel optical connection between said transmitter LED on one of said circuit cards and said receiver photodiode on any one of said circuit cards; and

d) wherein said ~~first and second~~ circuit cards are maintained in fixed relationship to one another via said common backplane to ~~effectuate~~ maintain continuous optical intercard communications ~~therebetween~~ between each of said circuit cards when said circuit cards become intermittently dislodged from electrical connection to said backplane, said intercard communications being conducted independent of shock-susceptible wired connectors. ~~such that said first receiver photodiode on said first circuit cards is operative to receive signals produced from said second transmitter LED of said second circuit card, said second receiver photodiode being operative to receive signals from said first transmitter LED of said first circuit card.~~

8. (Amended) A method for operatively interconnecting circuit cards within a computer to enable data to be transmitted and received therebetween comprising:

a) forming a common backplane having a plurality of circuit card connectors disposed in spaced apart relation thereon for supporting circuit cards in a generally parallal upright relationship;

b) providing a plurality of ~~first~~ circuit cards each having a ~~first~~ transmitter LED diode and a receiver photodiode ~~respectively~~ formed thereon;

~~c) providing a second circuit card having a second transmitter LED and a second receiver photodiode respectively formed thereon;~~

c) ~~d)~~ mounting each of ~~first~~ said circuit cards to a respective one of said circuit card connectors;

~~e) mounting said second circuit card to another of said circuit card connectors; and~~

d) forming an optical pathway between each of said circuit cards;

e) forming independent parallel optical connections between said transmitter LED on one of said circuit cards and said receiver photodiode on any one of said circuit cards; and

f) spatially arranging each of said ~~first~~ circuit cards relative to one another ~~said second circuit card~~ via said common backplane to ~~effectuate~~ maintain continuous optical intercard communications ~~therebetween~~ between each of said circuit cards when said circuit cards become intermittently dislodged from electrical connection to said backplane, said intercard communications being conducted independent of shock-susceptible wired connectors. ~~such that said first receiver~~

~~photodiode on said first circuit card is operative to receive signals produced from said second transmitter LED of said second circuit card., said second receiver photodiode being operative to receive signals from said first transmitter LED of said first circuit card.~~

15. (Amended) A shock-resistant system for operatively interconnecting circuit cards within a computer system to enable data to be transmitted and received therebetween comprising:

a) a common backplane having a plurality of circuit card connectors disposed in spaced apart relation thereon for supporting circuit cards in a generally upright parallel relationship;

b) a plurality of ~~first~~ circuit cards, each of said circuit cards being mounted to one of said circuit card connectors, ~~said first~~ each of said circuit cards having an ~~first~~ optical communications device formed thereon;

~~c) a second circuit card mounted to another of said circuit card connectors, said second circuit card having a second optical communications device formed thereon; and~~

c) an optical pathway formed between each of said circuit cards, each optical pathway forming a respective independent parallel optical connection between said optical communications devices; and

d) wherein ~~said first and second~~ each of said circuit cards are maintained in fixed relationship to one another via said common backplane to ~~effectuate~~ maintain continuous optical intercard communications ~~therebetween~~ between each of said circuit cards when said circuit cards become intermittently dislodged from electrical connection to said backplane, said intercard communications being conducted independent of shock-susceptible wired connectors.

BBB:STB

T:\Client Documents\NORTH\390a\NORTH-390A final Amendment (Marked)(v2).wpd